Groundwater/ Wellhead Protection

Background

Groundwater protection is important to protecting drinking water quality, water quality more generally, and natural resources. Groundwater is used widely as the source of drinking water in Indiana for community systems and individual homeowners. According to the Indiana Geological Survey, between 60-72% of Indiana's population depends on groundwater as a source for drinking and other household uses. Contaminated well water can pose a significant human health hazard. Contamination of groundwater also can have a significant effect on plants and animals, particularly in areas of karst.

Activities on the land surface can affect the quality of groundwater below. Some common sources of contamination of groundwater include:

- Commercial and industrial chemicals (including hazardous waste disposal and underground storage tanks)
- Agricultural chemicals
- Solid waste disposal
- Household waste disposal
- Wastewater disposal
- Sewer and septic systems
- Salt piles
- Underground storage tanks

The vulnerability of groundwater and drinking water to contamination varies by type of aquifer or subsurface geology and type of contaminant. The central and southwest areas of Indiana contain both unconsolidated sand and gravel and karst aquifers.

Description

A variety of regulatory and non-regulatory approaches and techniques that can be utilized by the local government and communities for groundwater and wellhead protection are described below. Additional information on protecting karst features can be accessed in the Karst Protection tool.

Wellhead Protection Planning: All public drinking water systems are required to prepare wellhead protection plans. These plans typically include the formation of a local planning team, the delineation of the wellhead protection area(s), the identification and inventory of potential contamination sources, provisions for public participation, the selection of management tools and techniques, the preparation of a contingency plan, and the preparation of a strategic plan for future development scenarios.

Local Land Use Regulations: Zoning and subdivision regulations are local regulatory tools that can be used to reduce or eliminate the impact of land uses that pose a risk to groundwater and drinking water. Within these broad tools, a number of specific techniques are available to regulate land uses within wellhead protection areas, including:

- Prohibiting of problematic land uses and activities
- Requiring special exception or conditional use permits with BZA review
- Utilizing an overlay zone to establish additional specialized land use regulations
- Requiring large lots to reduce the number of residential septic systems
- Requiring cluster subdivisions or planned unit developments that cluster residential lots outside areas of concern
- Setting performance standards with thresholds for the storage of potential contaminants or nitrogen and phosphorus loading limitations
- Requiring public sewers and/or limiting the use of small private sewage treatments plants
- Limiting direct discharge of runoff from subdivisions to streams or wetlands.
- Requiring environmental impact assessments for developments or subdivisions

Groundwater/ Wellhead Protection

Drainage and Erosion Control Regulations: Communities typically establish drainage and sediment and erosion control regulations in addition to land use regulations. These regulations are important tools because they can prevent contamination from entering streams and wetlands directly by establishing strict sediment and erosion controls for construction and requiring best management practices, vegetated buffer zones, and the reduction of impervious areas.

Health Regulations: In limited cases, health regulation can be used to regulate potential sources of contamination. In Indiana, local health departments have been delegated the authority to regulate the installation and maintenance of septic systems for one-and-two family residences. In some cases, communities may also regulate the storage and handling of hazardous chemicals through health regulations. Indiana communities do not have regulatory authority over the storage and use of pesticides and fertilizers.

Land Donation or Acquisition and Conservation Easements: In limited cases, communities may find it effective to control land within a protection area through ownership or by buying or holding a conservation easement that restricts development on that land. This non-regulatory tool may be particularly effective for communities that find themselves unable to adopt more controversial regulatory solutions.

Public Involvement, Public Education, and Voluntary Action: Public education and voluntary action are key components to maintaining viable public and private drinking water supplies. Public participation in the groundwater protection planning process and implementation of management strategies will create more awareness and ownership of the program. Public education also is a critical component of non-regulatory strategies predicated on voluntary action such as the proper maintenance of private wells and reducing household hazardous wastes. Public education can be accomplished in a variety of ways based on community needs, including press releases, brochures, fair booths, newsletters, meetings and workshops, and collaborative efforts with the media.

Household Hazardous Waste Disposal Programs: Inappropriate disposal of household wastes poses a threat to groundwater quality. According to the EPA, some methods of improper disposal include pouring hazardous materials down the drain, on the ground, into the sewer system, or discarding them in the trash. One non-regulatory option for reducing these potential hazards is the implementation of standing or periodic collection sites. Many communities hold tox-away days a few times a year to collect these wastes. These sites can be very effective when paired with public education.

Relevant Statutes

- Indiana Code 13-18-17 Groundwater Protection
- Indiana Administrative Code 327 IAC 8-4.1 Indiana Wellhead Protection Rule
- Indiana Administrative Code 327 IAC 2-11 Ground Water Quality Standards

Capacity Recommendations

Wellhead protection planning generally requires the assistance of a qualified expert to perform the hydrology studies necessary to delineate a wellhead protection area and evaluate the specific risks posed by present and potential chemical hazards. Zoning and other land use regulations require that communities have a plan commission as well as a comprehensive plan. The implementation of more sophisticated regulatory treatments under zoning and local health regulations, such as establishing performance standards, also may require in-house or contract technical experts.

Groundwater/ Wellhead Protection

Guidelines / Considerations for Implementation

- Groundwater protection can be complex and sometimes costly. It is important for communities to weigh the costs and benefits of certain protection measures. It is also critical to consider the cost of corrective action when deciding on the extent of groundwater protection.
- Consider management alternatives by evaluating local conditions and needs, public input, public tolerance for regulation, financial and social costs, economic development interests, and capacity for implementation and enforcement.
- Consider the use of regulatory and non-regulatory techniques to protect water quality. Because individual behavior can affect water quality significantly, non-regulatory tools such as public education are critical.
- Ensure local "ownership" and gain public support for the wellhead protection program and implementation measures to increase its chances of success.
- Communities should consider Indiana's home rule limitations (IC 36-1-3-8) when selecting implementation strategies.

Example Ordinances

- **Local Groundwater Protection** (Martin Jaffe and Frank Dinovo, 1987): This reference guide published by the American Planning Association [http://planning.org/] was adopted prior to the implementation of the Indiana Department of Environmental Management wellhead protection program in Indiana. The guide includes well field protection ordinance language from Boward County, Florida, Spokane County, Washington, Crystal Lake, Illinois, and Acton, Massachusetts.
- **A Guide to Wellhead Protection** (Witten, Jon, et al.,1995) ; This reference guide, published by the American Planning Association, contains practical (how-to) information for completing wellhead protection plans and selecting management strategies. It provides model ordinance language from local governments around the country organized by specific purpose.
- **Model Aquifer/Wellhead Protection Ordinance (Tallahassee, FL)**: This model ordinance includes sections that address inspections, best management practices, establishing primary and secondary wellhead protection areas, funding, and remediation activities. [http://www.epa.gov/owow/nps/ordinance/documents/modelord.doc]
- **Salt Lake City, Utah Groundwater Source Protection Overlay District**: This ordinance creates an overlay district that uses four distinct protection zones based on the time of travel and includes requirements for the use of septic systems within the protection zones. [http://www.epa.gov/owow/nps/ordinance/documents/salt_lake_city.pdf]

Example Studies

- **Indiana Case Studies** [http://cobweb.ecn.purdue.edu/SafeWater/wellhead/case.htm]: This Purdue Cooperative Extension site [http://cobweb.ecn.purdue.edu/SafeWater/wellhead/] includes wellhead protection planning case studies from a number of Indiana cities and towns.
- **"Ground Water Protection Plan Helps Rural Oklahoma Town"** (2007) [http://www.nrwa.org/2007Enviro/2007gw_ORWA.htm]: This National Rural Water Association [http://www.nrwa.org/] press release documents how the town of Wakita, Oklahoma reduced nitrate contamination levels by 50 percent through the implementation of a wellhead protection plan and open communication with local farmers.
- **Florida: Tallahassee** - Wellhead Protection Partnership Increases Scope of Protection [http://cfpub.epa.gov/safewater/sourcewater/sourcewater.cfm?action=Case_Studies&view=specificresults&casestudy=73]: This U.S. Environmental Protection Agency [http://cfpub.epa.gov/safewater/sourcewater/sourcewater.cfm?action=Case_Studies] source water protection case study documents the wellhead planning experience of Tallahassee, Florida.

Groundwater/ Wellhead Protection

Helpful References and Links

- **Local Groundwater Protection (Martin Jaffe and Frank Dinovo, 1987)**: This reference guide, published by the American Planning Association, was adopted prior to the implementation of the Indiana Department Environmental Management wellhead protection program in Indiana. It includes an extensive bibliography and model ordinance language that can be tailored to local needs.
- **A Guide to Wellhead Protection (Witten, Jon, et al.,1995)**: This reference guide, published by the American Planning Association, contains practical (how-to) information for completing wellhead protection plans and selecting management strategies. It includes an extensive bibliography, a list of educational resources, and model ordinance language that can be tailored to local needs.
- **Indiana Wellhead Protection** [http://www.state.in.us/idem/programs/water/swp/whpp/documents/whp-guidance.pdf]: This Indiana Department of Environmental Management (IDEM) guidance document provides information on roles, responsibilities and authorities, delineation of wellhead protection areas, identification and inventory of potential sources of contamination, management approaches, contingency planning, new wells, non-community wells, and public participation.
- **U.S. Geological Survey (USGS)** [http://water.usgs.gov/ogw/]: USGS provides a variety of useful information about groundwater, including data, publications; groundwater models, water resource information by state, information on specific groundwater issues, groundwater programs and project details, and groundwater software.
- **"Groundwater"** [http://www.atsdr.cdc.gov/es/general/en_groundwater_fs.html]: This fact sheet produced by the Agency for Toxic Substances & Disease Registry provides information about groundwater basics.
- **"Wellhead Protection"** [http://www.ecn.purdue.edu/SafeWater/wellhead/]: This Purdue Extension Service website provides a variety of resources to assist communities in wellhead planning, which includes publications, case studies, a list of consultants with expertise in wellhead planning, and educational materials.
- **Alliance of Indiana Rural Water** [http://www.inh2o.org/default.htm]: This website provides information on training workshops, online training, and articles and Indiana Department of Environmental Management fact sheets regarding wellhead issues. The Alliance of Indiana Rural Water is an affiliate of the National Rural Water Association (NRWA).
- **The Groundwater Foundation** [http://www.groundwater.org/index.html]: The nonprofit website provides a variety of educational resources from community and youth program information to public workshop and seminar written material.
- ***A Small Town Source Water Primer: Building Support for Protection Programs*** [http://www.lgean.org/html/whatsnew.cfm?id=58]: A free drinking water guide for small communities is available from the Local Government Environmental Assistance Network (LGEAN) [http://www.lgean.org/index.cfm]. This guide provides information on protecting drinking water supplies, the roles of local elected and appointed officials in maintaining safe drinking water, and how to gain public support.
- **"2003 National Source Water Protection Conference Materials"** [http://cfpub.epa.gov/safewater/sourcewater/sourcewater.cfm?action=Publications&view=filter&document_type_id=114]: This Environmental Protection Agency source water protection site includes speaker presentations and a post-workshop summary that include information on many of the issues included within this tool.
- **Using Land Conservation to Protect Drinking Water Supplies: Source Protection Handbook (Kim Hopper and Caryn Ernst, 2004)** [http://www.tpl.org/tier3_cd.cfm?content_item_id=18298&folder_id=175]: The handbook published by the Trust for Public Land and the American Water Works Association provides summarizes research about drinking water and public health, the costs of not protecting water sources, and the management of watersheds. It also provides resources to help communities make the case for land conservation and implement land conservation strategies.

Groundwater/ Wellhead Protection

- **"Private Drinking Water Wells"** [http://www.epa.gov/safewater/privatewells/index2.html]: This U.S. Environmental Protection Agency website provides basic information, frequently asked questions, and other vital information necessary to protecting a private well.
- **Drinking Water from Household Wells (2002)** [http://www.epa.gov/safewater/privatewells/pdfs/household_wells.pdf]: This U.S. Environmental Protection Agency publication is a basic primer for private well owners.
- **"Household Hazardous Waste"** [http://www.epa.gov/garbage/hhw.htm]: This U.S. Environmental Protection Agency (EPA) website is a primer about the definition of household hazardous wastes and options for managing them.

Helpful Contacts

Indiana Department of Environmental Management (IDEM) - Wellhead Protection Program
[http://www.in.gov/idem/programs/water/swp/whpp/index.html]
James Sullivan, (317) 308-3388, jsulliva@idem.in.gov
Matthew Baller, (317) 308-3323, mballer@idem.in.gov

Purdue Extension Service - Safe Water Office [http://cobweb.ecn.purdue.edu/SafeWater/]
Jane Frankenberger, (765) 496-6331,frankenb@purdue.edu
Brent Ladd, (765) 496-6331, laddb@purdue.edu

Other Possible Funding Sources

Grants and other funding sources for groundwater protection are limited. Communities may have to rely on local general funding sources such as local income taxes, utility user fees, property taxes, and permit and inspection fees.

- Section 205(j) Water Quality Management Planning Grants [http://www.in.gov/idem/resources/grants_loans/205j/index.html]: This Indiana Department of Environmental Management (IDEM) grant program provides funding for water quality management planning. It cannot be used for activities required by regulation.
- Indiana State Revolving Fund (SRF) Drinking Water Loan Program [http://www.in.gov/ifa/srf/#drinkingwater]: This Indiana Finance Authority (IFA) program provides low-interest loans to Indiana communities to wastewater and drinking water infrastructure improvement projects. In some cases the IFA will fund non-point source pollution projects.

Program Objectives and Issues Addressed

- Natural resources protection
- Growth management
- Infrastructure planning
- Protection of drinking water supplies
- Protection of specialized karst aquifers and habitat

See Also

- Karst Protection

Groundwater/ Wellhead Protection